ION SOURCE DEVICE

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- European:
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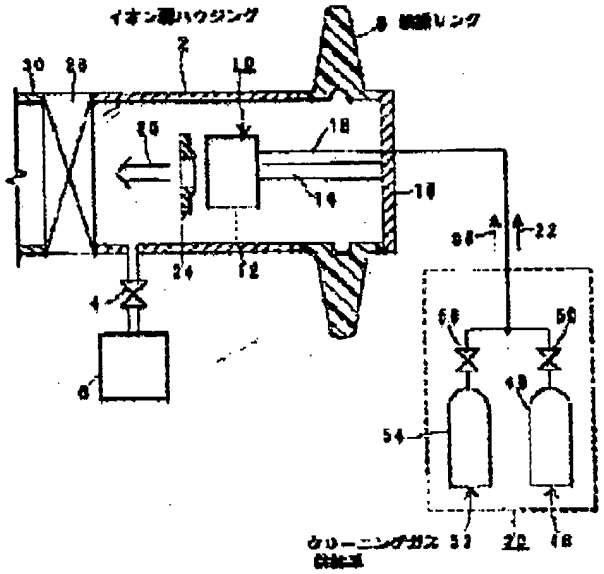
Abstract of **JP2000323051**

PROBLEM TO BE SOLVED: To easily eliminate contamination on an inner surface of an insulating ring or the like mounted on an ion source housing. SOLUTION: This ion source device holds an ion source head 10 having a plasma generating part 12 through an insulating ring 8 in an ion source housing 2 which is vacuum-exhausted, and is provided with a cleaning gas supply system 52 for supplying cleaning gas 58 containing halogen gas into the ion source housing 2.



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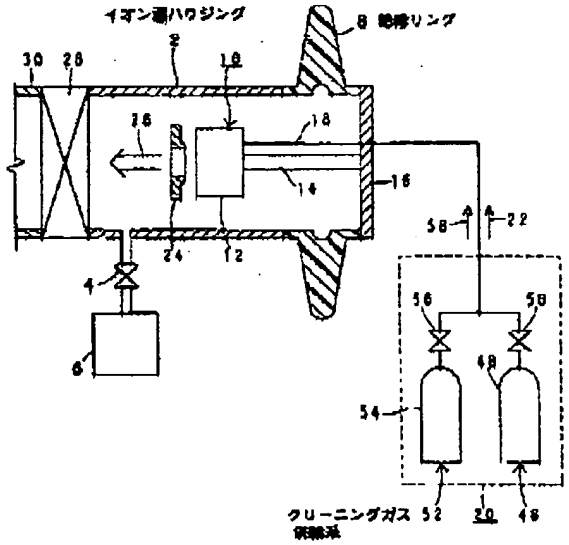
(54)【発明の名称】　イオン源装置

(57)【要約】
【課題】　イオン源ハウジングに取り付けられた絶縁リングの内面等の汚れを簡単に除去することができるようにする。
【解決手段】　このイオン源装置は、真空排気されるイオン源ハウジング２内に、絶縁リング８を介して、プラズマ生成部１２を有するイオン源ヘッド１０を保持した構造をしている。更に、イオン源ハウジング２内にハロゲンガスを含むクリーニングガス５８を供給するクリーニングガス供給系５２を備えている。



【特許請求の範囲】
【請求項１】 真空排気されるイオン源ハウジング内に、絶縁リングを介して、プラズマ生成部を有するイオン源ヘッドを保持した構造のイオン源装置において、前記イオン源ハウジング内にハロゲンガスを含むクリーニングガスを供給するクリーニングガス供給系を備えることを特徴とするイオン源装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は、例えばイオン注入装置等に用いられるものであって、イオン源ハウジング内に、絶縁リングを介して、プラズマ生成部を有するイオン源ヘッドを保持した構造のイオン源装置に関し、より具体的には、上記絶縁リングの内面等の汚れを簡単に除去する手段に関する。
【０００２】
【従来の技術】この種のイオン源装置の従来例を図３に示す。このイオン源装置は、筒状のイオン源ハウジング２内に、その一端部に取り付けられた絶縁リング８を介して、プラズマ生成部１２を有するイオン源ヘッド１０を保持した構造をしている。イオン源ヘッド１０は、この例では、プラズマ生成部１２を支持する支持体１４およびこの支持体１４を支持する端板１６を更に有している。端板１６は、絶縁リング８の外端部に取り付けられている。
【０００３】プラズマ生成部１２には、ガス供給部２０からガス導入管１８を経由してイオン源ガス２２が導入される。プラズマ生成部１２は、詳細は後述するけれども、このイオン源ガス２２を放電分解してプラズマ３６（図４参照）を生成する。イオン源ガス２２は、例えば、BF_3、AsH_3、PH_3等のように、Ｂ、Ａｓ、Ｐ等のドーパント（半導体への注入不純物）を含有するガスである。
【０００４】イオン源ハウジング２内であってプラズマ生成部１２の前方近傍には、プラズマ生成部１２内で生成されたプラズマからイオンビーム２６を引き出す引出し電極２４が配置されている。この引出し電極２４は、図示しない支持体によって、かつ必要な絶縁を確保して、イオン源ハウジング２から支持されている。
【０００５】上記プラズマ生成部１２、支持体１４および端板１６には、イオンビーム２６を所定のエネルギーに加速して引き出すために、図示しない直流電源から、正の高電圧（例えば２０～５０ｋＶ程度）が印加される。上記絶縁リング８は、この高電圧の電気絶縁を保つためのものである。プラズマ生成部１２につながるガス導入管１８およびガス供給部２０にも、通常は上記高電圧が印加される。従ってこれらも通常は高電位にある。
【０００６】上記イオン源ハウジング２内は、イオンビーム２６の損失を少なくする等のために、弁４を介して、真空排気装置６によって所定の高真空（例えば10^{-5}～10^{-6}Ｔｏｒｒ程度）に真空排気される。このイオン源ハウジング２の他端部には、この例では、弁２８を介して、上記イオンビーム２６を所望の場所へ導くビームライン管３０が接続されている。
【０００７】上記プラズマ生成部１２の構造の一例を図４に示す。このプラズマ生成部１２は、特開平９－３５６４８号公報に記載されたのと同様のものであり、上記イオン源ガス２２が導入されるプラズマ生成容器３２と、その一方側内に設けられたＵ字状のフィラメント３８と、プラズマ生成容器３２の他方側内に設けられた反射電極４２とを備えている。フィラメント３８および反射電極４２とプラズマ生成容器３２との間は、絶縁体４０および４４によってそれぞれ電気的に絶縁されている。
【０００８】プラズマ生成容器３２の前面部には、イオン引出しスリット３４が設けられている。プラズマ生成容器３２内には、図示しない磁界発生手段によって、フィラメント３８と反射電極４２とを結ぶ軸に沿う方向に磁界３７が印加される。
【０００９】フィラメント３８を通電加熱し、それとプラズマ生成容器３２との間でアーク放電を生じさせることによって、イオン源ガス２２を放電分解してプラズマ３６を生成することができる。その際、上記磁界３７および反射電極４２は、ガスの電離効率を高める働きをする。
【００１０】
【発明が解決しようとする課題】上記イオン源装置においては、プラズマ生成部１２に導入されたイオン源ガス２２の一部が、イオン引出しスリット３４を通してイオン源ハウジング２内に不可避的に漏れ出す。そしてこのイオン源ガス２２を構成するＢ、Ａｓ、Ｐ等を含む導電性の汚れが、イオン源ハウジング２、絶縁リング８等の内面に付着する。
【００１１】特に、絶縁リング８の内面に付着した上記汚れは、絶縁リング８の絶縁不良を引き起こすので、この汚れが進むと、上記プラズマ生成部１２等に前述した所定の高電圧を印加することができなくなり、このイオン源装置を運転することができなくなる。
【００１２】これを防止するために従来のイオン源装置では、時々、その運転を止めて当該装置を分解して、絶縁リング８の清掃を行う必要があり、非常に多くの手間と時間とを要していた。また、装置の休止時間が長くなり、稼動効率が悪かった。
【００１３】そこでこの発明は、上記のような絶縁リングの内面等の汚れを簡単に除去することができるようにしたイオン源装置を提供することを主たる目的とする。
【００１４】
【課題を解決するための手段】この発明のイオン源装置は、前記イオン源ハウジング内にハロゲンガスを含むクリーニングガスを供給するクリーニングガス供給系を備

えることを特徴としている。

【００１５】上記構成によれば、イオン源ハウジング内にクリーニングガスを供給することによって、上記絶縁リングの内面等に付着していた汚れは、ハロゲン化物のガスとなって除去される。除去されたハロゲン化物のガスは、イオン源ハウジング内を真空排気することに伴って、イオン源ハウジング外に排出される。このようにして、装置を分解せずに簡単に、しかも装置を分解する場合に比べて非常に短時間で、絶縁リングの内面等の汚れを除去することができる。従って、装置の稼動効率も向上する。

【００１６】

【発明の実施の形態】図１は、この発明に係るイオン源装置の一例を示す断面図である。図３に示した従来例と同一または相当する部分には同一符号を付し、以下においては当該従来例との相違点を主に説明する。

【００１７】このイオン源装置は、前述したイオン源ハウジング２内にハロゲンガスを含むクリーニングガス５８を供給するクリーニングガス供給系５２を備えている。

【００１８】このクリーニングガス供給系５２は、この例では、前述したガス供給部２０内に設けられていてクリーニングガス５８を供給するクリーニングガス源５４および弁５６と、このクリーニングガス源５４からのクリーニングガス５８をプラズマ生成部１２に供給するガス導入管１８とを有している。当該ガス供給部２０内には、前述したイオン源ガス２２を供給するイオン源ガス源４８および弁５０を有するイオン源ガス供給系４６も設けられている。ガス導入管１８は、この例ではイオン源ガス供給系４６とクリーニングガス供給系５２とで互いに共用している。従ってこの例では、クリーニング時には、ガス導入管１８を経由してプラズマ生成部１２（より具体的にはその図４に示すプラズマ生成容器３２）内にクリーニングガス５８が供給され、更にこのプラズマ生成部１２（具体的にはその図４に示すイオン引出しスリット３４）を経由してイオン源ハウジング２内にクリーニングガス５８が供給される。

【００１９】上記クリーニングガス５８は、フッ素ガス、塩素ガス、塩化フッ素ガス、フッ化イオウガスのようなハロゲンガス、または当該ハロゲンガスと他のガス（例えば不活性ガス）との混合ガスである。

【００２０】上記イオン源装置の運転方法の一例を説明すると、イオンビーム２６を引き出す通常運転時は、弁４を開いて真空排気装置６によってイオン源ハウジング２内を真空排気すると共に、弁５６を閉じ弁５０を開いてイオン源ガス供給系４６からプラズマ生成部１２にイオン源ガス２２を供給して、前述した作用によってイオンビーム２６を引き出す。このとき弁２８も開いておく。

【００２１】イオン源ハウジング２内のクリーニング時には、弁２８、４および５０を閉じておき、弁５６を開いてクリーニングガス供給系５２からプラズマ生成部１２およびイオン源ハウジング２内にクリーニングガス５８を供給する。これによって、プラズマ生成部１２内およびイオン源ハウジング２内にクリーニングガス５８が満たされ、絶縁リング８の内面に付着していた前述したようなＢ、Ａｓ、Ｐ等による汚れは、ハロゲン化物のガスとなって、例えばガス状のフッ化ホウ素（例えばBF_3）、フッ化ヒ素（例えばAsF_3）、フッ化リン（例えばPF_3）等となって、絶縁リング８の内面から除去される。従って、絶縁リング８の絶縁性能を回復させることができる。

【００２２】同時に、プラズマ生成部１２内の前述した絶縁体４０および４４（図４参照）に付着していたＢ，Ａｓ、Ｐ等の汚れも、上記のようなハロゲン化物のガスとなって、絶縁体４０および４４の表面から除去される。従って、この絶縁体４０および４４の絶縁性能を回復させることもできる。

【００２３】更に、イオン源ハウジング２の内面に付着していた上記のような汚れも、上記と同様にして除去される。

【００２４】そして一定時間（例えば予め試験によって定めておいた時間）が経過したら、弁５６を閉じ、かつ弁４を開いて真空排気装置６によってイオン源ハウジング２内を排気する。これによって、上記ハロゲン化物のガスは、イオン源ハウジング２外に排出される。それに伴ってイオン源ハウジング２内の真空度が向上する。

【００２５】イオン源ハウジング２内の真空度が所定のものに（例えば10^{-5}～10^{-6}Ｔｏｒｒ程度に）達したら、イオンビーム２６の引き出しを再開することができる。

【００２６】上記のようにして、このイオン源装置によれば、装置を分解せずに簡単に、しかも装置を分解する場合に比べて非常に短時間で、絶縁リング８の内面の汚れや、プラズマ生成部１２を構成する絶縁体４０および４４の表面の汚れ等を除去することができる。従って、装置の稼動効率も向上する。

【００２７】なお、図２に示す例のように、上記クリーニングガス供給系５２に、更に、弁６０およびガス導入管６２を設けて、このガス導入管６２からクリーニングガス５８を絶縁リング８の内面付近に供給するようにしても良い。そのようにすれば、絶縁リング８の内面にクリーニングガス５８を効率良く供給することができるので、絶縁リング８の内面の汚れをより効率良く除去することが可能になる。

【００２８】

【発明の効果】以上のようにこの発明によれば、上記のようなクリーニングガス供給系を備えているので、装置を分解せずに簡単に、しかも装置を分解する場合に比べて非常に短時間で、絶縁リングの内面等の汚れを除去す

ることができる。従って、装置の稼動効率も向上する。

【図面の簡単な説明】

【図１】この発明に係るイオン源装置の一例を示す断面図である。

【図２】この発明に係るイオン源装置の他の例を示す断面図である。

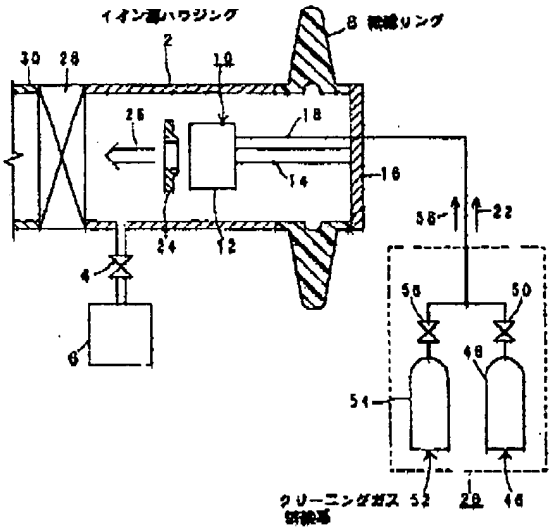
【図３】従来のイオン源装置の一例を示す断面図である。

【図４】図１ないし図３中のプラズマ生成部周りの詳細例を示す断面図である。

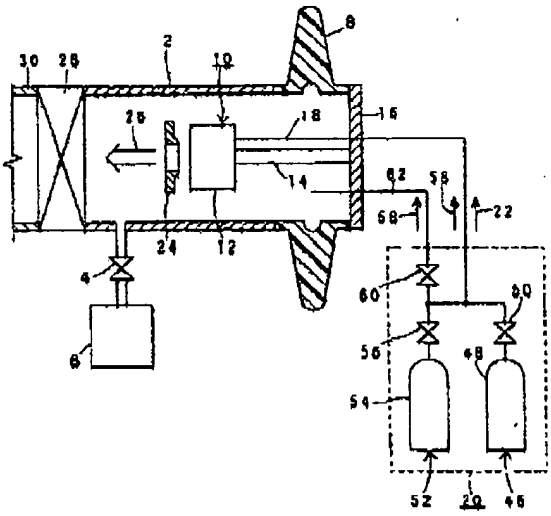
【符号の説明】

２　イオン源ハウジング
６　真空排気装置
８　絶縁リング
１０　イオン源ヘッド
１２　プラズマ生成部
１８　ガス導入管
２０　ガス供給部
２２　イオン源ガス
４６　イオン源ガス供給系
５２　クリーニングガス供給系
５８　クリーニングガス

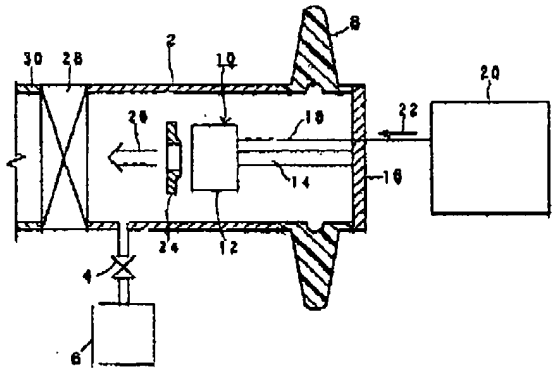
【図１】



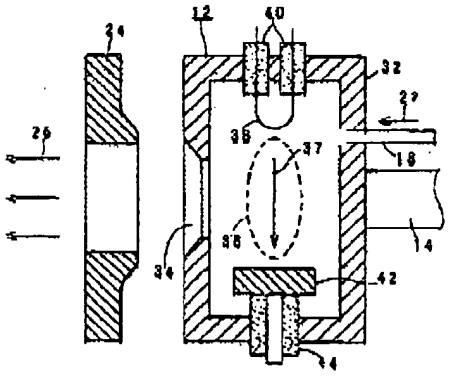
【図２】



【図３】



【図４】



CLAIMS

[Claim(s)]
[Claim 1] Ion source equipment characterized by having the cleaning gas supply system which supplies the cleaning gas which contains halogen gas in said ion source housing in ion source housing by which evacuation is carried out in the ion source equipment of the structure which held the ion source head which has the plasma production section through the insulating ring.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is used for ion implantation equipment etc., and, more specifically, relates to a means to remove dirt, such as an inside of the above-mentioned insulating ring, simply, about the ion source equipment of the structure holding the ion source head which has the plasma production section through an insulating ring in ion source housing.
[0002]
[Description of the Prior Art] The conventional example of this kind of ion source equipment is shown in drawing 3 . This ion source equipment is having structure holding the ion source head 10 which has the plasma production section 12 through the insulating ring 8 attached in the tubed ion source housing 2 at that end section. The ion source head 10 has further the end plate 16 which supports the base material 14 which supports the plasma production section 12, and this base material 14 in this example. The end plate 16 is attached in the heel of an insulating ring 8.
[0003] Ion source gas 22 is introduced into the plasma production section 12 via the gas installation tubing 18 from the gas supply section 20. Although the plasma production section 12 is mentioned later for details, discharge decomposition of this ion source gas 22 is carried out, and it generates the plasma 36 (refer to drawing 4). ion source gas 22 -- for example, BF3, AsH3, and PH3 etc. -- it is gas containing dopants (impregnation impurity to a semi-conductor), such as B, As, and P, like.
[0004] It is in the ion source housing 2, and the cash-drawer electrode 24 which pulls out an ion beam 26 from the plasma generated within the plasma production section 12 is arranged near the front of the plasma production section 12. the base material which does not illustrate this cash-drawer electrode 24 -- and a required insulation is secured and it is supported from the ion source housing 2.
[0005] In order to accelerate and pull out an ion beam 26 to predetermined energy, the forward high voltage (for example, about 20-50kV) is impressed to the above-mentioned plasma production section 12, a base material 14, and an end plate 16 from the DC power supply which are not illustrated. The above-mentioned insulating ring 8 is for maintaining the electric insulation of this high voltage. The above-mentioned high voltage is usually impressed also to the gas installation tubing 18 and the gas supply section 20 which are connected with the plasma production section 12. Therefore, these are also usually in high potential.

[0006] Evacuation of the inside of the above-mentioned ion source housing 2 is carried out to a predetermined high vacuum (for example, 10-5 - 10-6Torr extent) by evacuation equipment 6 through a valve 4 for lessening loss of an ion beam 26 etc. In this example, the beam line tubing 30 which leads the above-mentioned ion beam 26 to a desired location is connected to the other end of this ion source housing 2 through the valve 28.
[0007] An example of the structure of the above-mentioned plasma production section 12 is shown in drawing 4 . This plasma production section 12 is the same, and it has the plasma production container 32 with which the above-mentioned ion source gas 22 is introduced, the filament 38 of the shape of U character established in that one side, and the reflector 42 prepared in the other side of the plasma production container 32 as it was indicated by JP,9-35648,A. Between the filament 38 and the reflector 42, and the plasma production container 32, it insulates electrically with insulators 40 and 44, respectively.
[0008] The ion cash-drawer slit 34 is formed in the front section of the plasma production container 32. A field 37 is impressed in the direction in alignment with the shaft which ties a filament 38 and a reflector 42 with the field generating means which is not illustrated in the plasma production container 32.
[0009] By carrying out energization heating of the filament 38, and producing arc discharge between it and the plasma production container 32, discharge decomposition of the ion source gas 22 can be carried out, and the plasma 36 can be generated. The above-mentioned field 37 and a reflector 42 serve to raise the electrolytic dissociation efficiency of gas in that case.
[0010]
[Problem(s) to be Solved by the Invention] In the above-mentioned ion source equipment, a part of ion source gas 22 introduced into the plasma production section 12 begins to leak unescapable in the ion source housing 2 through the ion cash-drawer slit 34. And the conductive dirt containing B and As which constitute this ion source gas 22, P, etc. adheres to the inside of the ion source housing 2 and insulating ring 8 grade.
[0011] When this dirt advances, it becomes impossible to impress the predetermined high voltage mentioned above in the above-mentioned plasma production section 12 grade, and it becomes impossible to operate this ion source equipment, since especially the above-mentioned dirt adhering to the inside of an insulating ring 8 wakes up the poor insulation of an insulating ring 8.
[0012] In order to prevent this, sometimes the operation needed to be stopped, the equipment concerned needed to be disassembled, the insulating ring 8 needed to be cleaned, and conventional ion source equipment had taken very much time and effort and time amount. Moreover, the quiescent time of equipment became long and operation effectiveness was bad.
[0013] Then, this invention sets it as the main purpose to offer the ion source equipment from which it enabled it to remove dirt, such as an inside of the above insulating rings, simply.
[0014]
[Means for Solving the Problem] The ion source equipment of this invention is characterized by having the cleaning gas supply system which supplies the cleaning gas containing halogen gas in said ion source housing.
[0015] According to the above-mentioned configuration, by supplying cleaning gas in ion source housing, the dirt adhering to the inside of the above-mentioned insulating ring etc. serves as gas of a halogenide, and is removed. The gas of the removed halogenide is discharged out of ion source housing in connection with carrying out evacuation of the inside of ion source housing. Thus, compared with the case where equipment is moreover disassembled, dirt, such as an inside

of an insulating ring, can be removed very much easily in a short time, without disassembling equipment. Therefore, the operation effectiveness of equipment also improves.

[0016]

[Embodiment of the Invention] Drawing 1 is the sectional view showing an example of the ion source equipment concerning this invention. The same sign is given to the same as that of the conventional example shown in drawing 3 , or a corresponding part, and difference with the conventional example concerned is mainly explained below.

[0017] This ion source equipment is equipped with the cleaning gas supply system 52 which supplies the cleaning gas 58 containing halogen gas in the ion source housing 2 mentioned above.

[0018] This cleaning gas supply system 52 has the source 54 of cleaning gas and valve 56 which are prepared in the gas supply section 20 mentioned above, and supply cleaning gas 58, and the gas installation tubing 18 which supplies the cleaning gas 58 from this source 54 of cleaning gas to the plasma production section 12 in this example. In the gas supply section 20 concerned, the ion source gas supply system 46 which has the source 48 of ion source gas and valve 50 which supply the ion source gas 22 mentioned above is also established. The gas installation tubing 18 of each other is shared in this example by the ion source gas supply system 46 and the cleaning gas supply system 52. Therefore, in this example, at the time of cleaning, cleaning gas 58 is supplied via the gas installation tubing 18 in the plasma production section 12 (plasma production container 32 specifically shown in that drawing 4), and cleaning gas 58 is further supplied in the ion source housing 2 via this plasma production section 12 (ion cash-drawer slit 34 specifically shown in that drawing 4).

[0019] The above-mentioned cleaning gas 58 is the mixed gas of fluorine gas, chlorine gas, chlorination fluorine gas, halogen gas like sulfur fluoride gas or the halogen gas concerned, and other gas (for example, inert gas).

[0020] Explanation of an example of the operating method of the above-mentioned ion source equipment pulls out an ion beam 26 according to the operation which pulls out an ion beam 26 and which closed the valve 56, opened the valve 50, and supplied and mentioned ion source gas 22 above from the ion source gas supply system 46 to the plasma production section 12 while the valve 4 was opened at the time of operation and it usually carried out evacuation of the inside of the ion source housing 2 with evacuation equipment 6. The valve 28 is also opened at this time.

[0021] Valves 28, 4, and 50 are closed at the time of the cleaning in the ion source housing 2, a valve 56 is opened and cleaning gas 58 is supplied in the plasma production section 12 and the ion source housing 2 from the cleaning gas supply system 52. Cleaning gas 58 is filled in the plasma production section 12 and the ion source housing 2, and the dirt by B and As adhering to the inside of an insulating ring 8 which were mentioned above, P, etc. serves as gas of a halogenide, for example, it becomes gas boron fluoride (for example, BF3), arsenic fluoride (for example, AsF3), phosphorus fluoride (for example, PF3), etc., and is removed from the inside of an insulating ring 8 by this. Therefore, the insulating engine performance of an insulating ring 8 can be recovered.

[0022] Dirt, such as B and As adhering to the insulators 40 and 44 (refer to drawing 4) mentioned above in the plasma production section 12, and P, also serves as gas of the above halogenides, and is removed from the front face of insulators 40 and 44 by coincidence. Therefore, the insulating engine performance of these insulators 40 and 44 can also be recovered.

[0023] Furthermore, the above dirt adhering to the inside of the ion source housing 2 as well as the above is removed.

[0024] And if fixed time amount (for example, time amount beforehand defined by trial) passes, a valve 56 will be closed, and a valve 4 will be opened, and the inside of the ion source housing 2 will be exhausted with evacuation equipment 6. The gas of the above-mentioned halogenide is discharged out of the ion source housing 2 by this. In connection with it, the degree of vacuum in the ion source housing 2 improves.
[0025] If the degree of vacuum in the ion source housing 2 reaches a predetermined thing (to for example, 10-5 - 10-6Torr extent), the drawer of an ion beam 26 can be resumed.
[0026] According to this ion source equipment as mentioned above, compared with the case where equipment is moreover disassembled, the dirt of the inside of an insulating ring 8, the dirt of the front face of the insulators 40 and 44 which constitute the plasma production section 12, etc. can be removed very much easily in a short time, without disassembling equipment. Therefore, the operation effectiveness of equipment also improves.
[0027] In addition, a valve 60 and the gas installation tubing 62 are formed, and you may make it supply cleaning gas 58 near the inside of an insulating ring 8 from this gas installation tubing 62 further like the example shown in drawing 2 at the above-mentioned cleaning gas supply system 52. If it is made such, since cleaning gas 58 can be efficiently supplied to the inside of an insulating ring 8, it becomes possible to remove the dirt of the inside of an insulating ring 8 more efficiently.
[0028]
[Effect of the Invention] Since it has the above cleaning gas supply systems as mentioned above according to this invention, compared with the case where equipment is moreover disassembled, dirt, such as an inside of an insulating ring, can be removed very much easily in a short time, without disassembling equipment. Therefore, the operation effectiveness of equipment also improves.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention is used for ion implantation equipment etc., and, more specifically, relates to a means to remove dirt, such as an inside of the above-mentioned insulating ring, simply, about the ion source equipment of the structure holding the ion source head which has the plasma production section through an insulating ring in ion source housing.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The conventional example of this kind of ion source equipment is shown in drawing 3 . This ion source equipment is having structure holding the ion source head 10 which has the plasma production section 12 through the insulating ring 8 attached in the tubed

ion source housing 2 at that end section. The ion source head 10 has further the end plate 16 which supports the base material 14 which supports the plasma production section 12, and this base material 14 in this example. The end plate 16 is attached in the heel of an insulating ring 8.
[0003] Ion source gas 22 is introduced into the plasma production section 12 via the gas installation tubing 18 from the gas supply section 20. Although the plasma production section 12 is mentioned later for details, discharge decomposition of this ion source gas 22 is carried out, and it generates the plasma 36 (refer to drawing 4). ion source gas 22 -- for example, BF3, AsH3, and PH3 etc. -- it is gas containing dopants (impregnation impurity to a semi-conductor), such as B, As, and P, like.
[0004] It is in the ion source housing 2, and the cash-drawer electrode 24 which pulls out an ion beam 26 from the plasma generated within the plasma production section 12 is arranged near the front of the plasma production section 12. the base material which does not illustrate this cash-drawer electrode 24 -- and a required insulation is secured and it is supported from the ion source housing 2.
[0005] In order to accelerate and pull out an ion beam 26 to predetermined energy, the forward high voltage (for example, about 20-50kV) is impressed to the above-mentioned plasma production section 12, a base material 14, and an end plate 16 from the DC power supply which are not illustrated. The above-mentioned insulating ring 8 is for maintaining the electric insulation of this high voltage. The above-mentioned high voltage is usually impressed also to the gas installation tubing 18 and the gas supply section 20 which are connected with the plasma production section 12. Therefore, these are also usually in high potential.
[0006] Evacuation of the inside of the above-mentioned ion source housing 2 is carried out to a predetermined high vacuum (for example, 10-5 - 10-6Torr extent) by evacuation equipment 6 through a valve 4 for lessening loss of an ion beam 26 etc. In this example, the beam line tubing 30 which leads the above-mentioned ion beam 26 to a desired location is connected to the other end of this ion source housing 2 through the valve 28.
[0007] An example of the structure of the above-mentioned plasma production section 12 is shown in drawing 4 . This plasma production section 12 is the same, and it has the plasma production container 32 with which the above-mentioned ion source gas 22 is introduced, the filament 38 of the shape of U character established in that one side, and the reflector 42 prepared in the other side of the plasma production container 32 as it was indicated by JP,9-35648,A. Between the filament 38 and the reflector 42, and the plasma production container 32, it insulates electrically with insulators 40 and 44, respectively.
[0008] The ion cash-drawer slit 34 is formed in the front section of the plasma production container 32. A field 37 is impressed in the direction in alignment with the shaft which ties a filament 38 and a reflector 42 with the field generating means which is not illustrated in the plasma production container 32.
[0009] By carrying out energization heating of the filament 38, and producing arc discharge between it and the plasma production container 32, discharge decomposition of the ion source gas 22 can be carried out, and the plasma 36 can be generated. The above-mentioned field 37 and a reflector 42 serve to raise the electrolytic dissociation efficiency of gas in that case.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since it has the above cleaning gas supply systems as mentioned above according to this invention, compared with the case where equipment is moreover disassembled, dirt, such as an inside of an insulating ring, can be removed very much easily in a short time, without disassembling equipment. Therefore, the operation effectiveness of equipment also improves.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In the above-mentioned ion source equipment, a part of ion source gas 22 introduced into the plasma production section 12 begins to leak unescapable in the ion source housing 2 through the ion cash-drawer slit 34. And the conductive dirt containing B and As which constitute this ion source gas 22, P, etc. adheres to the inside of the ion source housing 2 and insulating ring 8 grade.

[0011] When this dirt advances, it becomes impossible to impress the predetermined high voltage mentioned above in the above-mentioned plasma production section 12 grade, and it becomes impossible to operate this ion source equipment, since especially the above-mentioned dirt adhering to the inside of an insulating ring 8 wakes up the poor insulation of an insulating ring 8.

[0012] In order to prevent this, sometimes the operation needed to be stopped, the equipment concerned needed to be disassembled, the insulating ring 8 needed to be cleaned, and conventional ion source equipment had taken very much time and effort and time amount. Moreover, the quiescent time of equipment became long and operation effectiveness was bad.

[0013] Then, this invention sets it as the main purpose to offer the ion source equipment from which it enabled it to remove dirt, such as an inside of the above insulating rings, simply.

[Translation done.]

MEANS

[Means for Solving the Problem] The ion source equipment of this invention is characterized by having the cleaning gas supply system which supplies the cleaning gas containing halogen gas in said ion source housing.

[0015] According to the above-mentioned configuration, by supplying cleaning gas in ion source housing, the dirt adhering to the inside of the above-mentioned insulating ring etc. serves as gas of a halogenide, and is removed. The gas of the removed halogenide is discharged out of ion source housing in connection with carrying out evacuation of the inside of ion source housing. Thus, compared with the case where equipment is moreover disassembled, dirt, such as an inside of an insulating ring, can be removed very much easily in a short time, without disassembling

equipment. Therefore, the operation effectiveness of equipment also improves.

[0016]

[Embodiment of the Invention] Drawing 1 is the sectional view showing an example of the ion source equipment concerning this invention. The same sign is given to the same as that of the conventional example shown in drawing 3 , or a corresponding part, and difference with the conventional example concerned is mainly explained below.

[0017] This ion source equipment is equipped with the cleaning gas supply system 52 which supplies the cleaning gas 58 containing halogen gas in the ion source housing 2 mentioned above.

[0018] This cleaning gas supply system 52 has the source 54 of cleaning gas and valve 56 which are prepared in the gas supply section 20 mentioned above, and supply cleaning gas 58, and the gas installation tubing 18 which supplies the cleaning gas 58 from this source 54 of cleaning gas to the plasma production section 12 in this example. In the gas supply section 20 concerned, the ion source gas supply system 46 which has the source 48 of ion source gas and valve 50 which supply the ion source gas 22 mentioned above is also established. The gas installation tubing 18 of each other is shared in this example by the ion source gas supply system 46 and the cleaning gas supply system 52. Therefore, in this example, at the time of cleaning, cleaning gas 58 is supplied via the gas installation tubing 18 in the plasma production section 12 (plasma production container 32 specifically shown in that drawing 4), and cleaning gas 58 is further supplied in the ion source housing 2 via this plasma production section 12 (ion cash-drawer slit 34 specifically shown in that drawing 4).

[0019] The above-mentioned cleaning gas 58 is the mixed gas of fluorine gas, chlorine gas, chlorination fluorine gas, halogen gas like sulfur fluoride gas or the halogen gas concerned, and other gas (for example, inert gas).

[0020] Explanation of an example of the operating method of the above-mentioned ion source equipment pulls out an ion beam 26 according to the operation which pulls out an ion beam 26 and which closed the valve 56, opened the valve 50, and supplied and mentioned ion source gas 22 above from the ion source gas supply system 46 to the plasma production section 12 while the valve 4 was opened at the time of operation and it usually carried out evacuation of the inside of the ion source housing 2 with evacuation equipment 6. The valve 28 is also opened at this time.

[0021] Valves 28, 4, and 50 are closed at the time of the cleaning in the ion source housing 2, a valve 56 is opened and cleaning gas 58 is supplied in the plasma production section 12 and the ion source housing 2 from the cleaning gas supply system 52. Cleaning gas 58 is filled in the plasma production section 12 and the ion source housing 2, and the dirt by B and As adhering to the inside of an insulating ring 8 which were mentioned above, P, etc. serves as gas of a halogenide, for example, it becomes gas boron fluoride (for example, BF3), arsenic fluoride (for example, AsF3), phosphorus fluoride (for example, PF3), etc., and is removed from the inside of an insulating ring 8 by this. Therefore, the insulating engine performance of an insulating ring 8 can be recovered.

[0022] Dirt, such as B and As adhering to the insulators 40 and 44 (refer to drawing 4) mentioned above in the plasma production section 12, and P, also serves as gas of the above halogenides, and is removed from the front face of insulators 40 and 44 by coincidence. Therefore, the insulating engine performance of these insulators 40 and 44 can also be recovered.

[0023] Furthermore, the above dirt adhering to the inside of the ion source housing 2 as well as the above is removed.

[0024] And if fixed time amount (for example, time amount beforehand defined by trial) passes,

a valve 56 will be closed, and a valve 4 will be opened, and the inside of the ion source housing 2 will be exhausted with evacuation equipment 6. The gas of the above-mentioned halogenide is discharged out of the ion source housing 2 by this. In connection with it, the degree of vacuum in the ion source housing 2 improves.

[0025] If the degree of vacuum in the ion source housing 2 reaches a predetermined thing (to for example, 10-5 - 10-6Torr extent), the drawer of an ion beam 26 can be resumed.

[0026] According to this ion source equipment as mentioned above, compared with the case where equipment is moreover disassembled, the dirt of the inside of an insulating ring 8, the dirt of the front face of the insulators 40 and 44 which constitute the plasma production section 12, etc. can be removed very much easily in a short time, without disassembling equipment. Therefore, the operation effectiveness of equipment also improves.

[0027] In addition, a valve 60 and the gas installation tubing 62 are formed, and you may make it supply cleaning gas 58 near the inside of an insulating ring 8 from this gas installation tubing 62 further like the example shown in drawing 2 at the above-mentioned cleaning gas supply system 52. If it is made such, since cleaning gas 58 can be efficiently supplied to the inside of an insulating ring 8, it becomes possible to remove the dirt of the inside of an insulating ring 8 more efficiently.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing an example of the ion source equipment concerning this invention.

[Drawing 2] It is the sectional view showing other examples of the ion source equipment concerning this invention.

[Drawing 3] It is the sectional view showing an example of conventional ion source equipment.

[Drawing 4] It is the sectional view showing the example of a detail of the circumference of the plasma production section in drawing 1 thru/or drawing 3 .

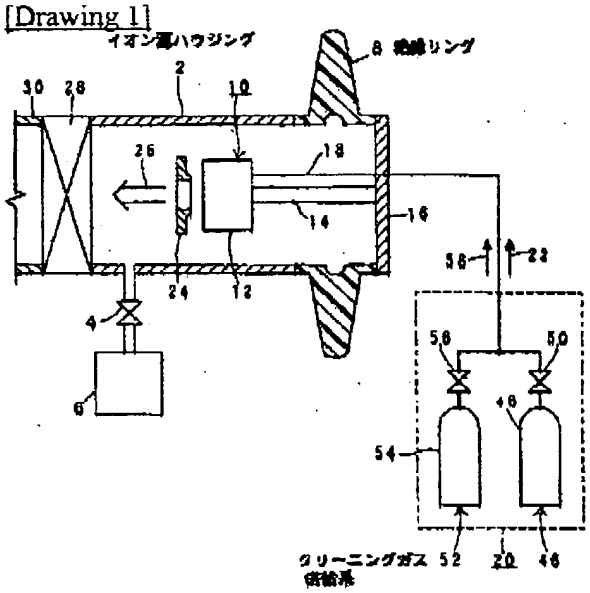
[Description of Notations]

2 Ion Source Housing
6 Evacuation Equipment
8 Insulating Ring
10 Ion Source Head
12 Plasma Production Section
18 Gas Installation Tubing
20 Gas Supply Section
22 Ion Source Gas
46 Ion Source Gas Supply System
52 Cleaning Gas Supply System
58 Cleaning Gas

[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]

[Drawing 3]

[Drawing 4]

[Translation done.]